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INDUSTRIAL

Subject:
Proposed Plainwell No. 2 Dam Area Soil Sampling Locations

Date:
January 22, 2008

Dear Mr. Saric:

Contact:
Michael J. Erickson

The SRI/FS Work Plan for Area 1 of the Kalamazoo River calls for reconnaissance and survey work to map the approximate extent of the historically inundated area in order to develop appropriate soil sampling locations. The sampling location plan is to be established using a random unaligned grid overlain on the approximate extent of the floodplain. The plan is to be approved by USEPA prior to sampling. This letter presents the results of the delineation of the historical inundation area (i.e. the floodplain) upstream of the Plainwell No. 2 Dam and proposed locations for floodplain soil sampling for USEPA review.

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The specific requirements of the work plan are to "...map the extent of the historically inundated area at the time the No. 2 Dam was operable based on terrain, soil characteristics, physical observations, and vegetation types. Historical aerial photos and other pertinent information will also be used." The delineation of the historical inundation area relied on reconnaissance information from field work conducted in fall 2007, aerial photos, property parcel descriptions and maps, and the 1979 dam inspection report (U.S. Army Corps of Engineers [USACE], 1979).

Plainwell No. 2 Dam History

The Plainwell No. 2 Dam consisted of four separate concrete structures—a right diversion structure, a left diversion structure, a head gate structure, and a waste gate structure—and earthen embankments that collectively were approximately 2,520 feet in length. The two upstream diversion structures—which were constructed in conjunction with the power canal (i.e. mill race)—were used to divert flow into the

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power canal race and maintain the water level in the canal. The right diversion structure consisted of concrete spillway gate bays and the left diversion structure consisted of a concrete spillway; the two diversion structures were separated by an earthen embankment. There was also an earthen embankment separating the left abutment of the left diversion structure and the head gate structure (USACE 1979). The head gate structure in the power canal was formerly used to regulate the discharge through the powerhouse, and consisted of a concrete spillway with no control devices. Attachment 1 presents two figures from the USACE's National Dam Safety Program Inspection Report (USACE 1979): a location and vicinity map, and a plan view of the four dam structures.

The Plainwell No. 2 Dam impounded approximately 185 acre-feet of water at a reported pool elevation of 722.2 feet above mean sea level (MSL) (USACE, 1979), which was approximately the elevation of the low point in the earthen embankment separating the two diversion structures. The maximum spillway discharge capacity of the dam was estimated to be 5,613 cubic feet per second (cfs) with a pond elevation of 722.2 feet. This discharge was approximately 10 percent of the probable maximum flood and 58 percent of the 100-year frequency discharge. This included flow over both the left and right diversion structures and through the power canal.

According to the MDEQ, the dam and associated structures were partially removed in the early 1980s such that there is no longer any "significant amount of water" (Hayes 1998a) impounded in the area. It was the opinion of the MDNR that the dam "will not significantly impound any water that would pose a hazardous condition to the public safety" (Cook 1980). The dam and associated structures are currently classified as a low hazard potential (Hayes 1998b) and its primary continuing purpose is to maintain flow through the mill race.

Historical Inundation Area Delineation

Aerial photos of the area from 1938, 1950, 1960, 1967, 1974, 1981, 1992, and 1999 were obtained from Environmental Data Resources, Inc. (EDR) in Milford, Connecticut. Upon inspection, the earlier photos show greater areas of inundation when compared to more recent photos. An initial delineation was prepared using the 1938 photo, where the extent of inundation was based on the presence of surface water and colorations or surface features that may indicate periodic flooding and deposition (Figure 1). Figure 1 is overlain on the 1999 aerial photo in Figure 2 to illustrate the apparently smaller area occupied by the river in recent times since removal of the dam structures lowered the pool elevation.

The aerial photos provide useful information, but are only a snapshot of conditions upstream of the dam. During periods of higher flow an area larger than that shown in the aerial photos may have been flooded. Survey and reconnaissance of the area was performed in October and November 2007 to provide additional information on floodplain boundaries. Elevations were also surveyed along transects (Figure 3), and around the right and left diversion structures (Figures 4 and 5, respectively) in fall 2007. Surveyed ground elevations and field observations indicate the floodplain is relatively flat and lack distinct banks in a number of areas. Evidence of high water was observed, suggesting a larger area than that delineated based on the 1938 air photo was occasionally flooded. The outer edge of the river valley is discernible as a distinct change in slope; however, the valley limits appear to be located well beyond the normal floodplain in some areas.

The Dam Inspection Report (USACE, 1979) lists the normal pool elevation as 720 feet above MSL and the maximum pool elevation as 722.2 feet above MSL (NGVD 1929). These pool elevations would largely be confined to the existing channel (i.e. within the 1999 shoreline); however, a discrepancy of approximately 2 feet was observed between surveyed elevations of the water control structure surfaces and corresponding elevations cited in the 1979 dam inspection report. Elevations at points reported in the Dam Inspection Report were surveyed in fall 2007 to be approximately 2.0 feet higher than the elevations reported. For example, the top of the sill of the right diversion structure was reported as 719.5 feet in the Dam Inspection Report, and the adjacent embankment elevation was given as 725.5 feet. Recent survey data show the elevation of the sill of the right diversion structure to be 721.6 feet, whereas the adjacent embankment elevation is 726.3 feet. Survey elevations of the right and left diversion structures are presented in Figures 4 and 5, respectively. During development of survey information for design of the Plainwell Time-Critical Removal Action currently underway, a similar discrepancy was noted with respect to reported elevations for the Plainwell Dam. At that time, the USGS benchmarks were independently resurveyed by a third party to confirm their elevations, from which it was concluded that the older reported elevations for the Plainwell Dam were incorrect. It is suspected that the elevations in the Dam Inspection Report (USACE 1979) for the Plainwell No. 2 Dam are also incorrect.

Based on the observed discrepancies for the water diversion structure elevations, it is possible that the pool elevation in the Dam Inspection Report was actually 2 feet higher than reported by USACE (1979). When this discrepancy is taken into

account, the resulting pool elevation is 724.2 feet, which is 0.8 feet lower than the 725-foot elevation that defines the extent of the river bottom owned by the State of Michigan.

Property tax plats show an elevation contour of 725 feet (no reference datum is provided) on the islands and on the parcels adjacent to the river. This contour defines the extent of floodplains owned by MDNR, as described in the legal lot descriptions for riverside parcels. Based on the fall 2007 survey, nearly the entire floodplain area lies below 725 feet, with the exception of a few localized areas. The 725-foot elevation contour corresponds approximately to the valley's edge based on visual observations and locations where survey data were collected. Based upon surveyed elevations and visual inspection of the area behind the Plainwell No. 2 Dam, it can be reasonably concluded that the lateral extent of inundation extended no further than the 725 foot elevation contour.

If the maximum pool elevation discussed in the Dam Inspection Report is assumed to be 724.2 feet rather than 722.2 feet, the area of inundation would be larger than that shown in the air photos. Figure 6 shows the estimated extent of the pool for a water surface elevation of 724.2 feet and for comparison, the area delineated based on the 1938 photo. At a pool elevation of 724.2 feet, the area flooded would include most of the low-lying area adjacent to the river. This larger area was selected for further sampling based on the uncertainty with respect to the pool elevation, as shown by the proposed sample grid in Figure 6.

Proposed Sample Locations

Proposed sample locations (Table 1) were established by laying an unaligned 300-foot grid over the estimated extent of inundation when a maximum pool elevation of 724.2 feet is assumed. The extent of inundation is shown by the dashed green line in Figure 6. This area, not including the river surface, covers 89 acres. A total of 45 locations were selected by computer randomization (see Figure 6). Soil cores will be collected at the proposed locations according to the Multi-Area Field Sampling Plan.

ARCADIS

Mr. James Saric
January 22, 2008

I will contact you to discuss this proposed plan. Once an USEPA-approved plan is agreed upon, ARCADIS will initiate sampling, subject to weather constraints.

Sincerely,

ARCADIS



Michael J. Erickson, P.E.
Associate Vice President

Copies:

Paul Bucholtz, MDEQ
Jeff Keiser, CH2M HILL
Michael Scoville, ARCADIS
Mark Brown, PhD, Georgia-Pacific Corporation
L. Chase Fortenberry, P.G., Georgia-Pacific Corporation
Mark Tapp, Millennium Holdings, LLC
David Guier, Millennium Holdings, LLC

Enclosures:

Tables

Table 1 – Proposed Soil Sampling Locations

Figures

Figure 1 – Historic Inundation Area – 1938 Aerial
Figure 2 – Historic Inundation Area – 1999 Aerial
Figure 3 – Surveyed Elevations – Fall 2007
Figure 4 – Right Diversion Structure Survey
Figure 5 – Left Diversion Structure Survey
Figure 6 – Proposed Sample Locations

Attachments

Attachment 1 - USACE's National Dam Safety Program Inspection Report
Figures

References

Cook, L.A., MDNR. 1980. Letter to G.N. Longworth, Plainwell Paper Company, re: Plainwell No. 2 Dam. November 26, 1980.

Hayes, J., MDEQ. 1998a. Personal Communication with D.E. Penniman, BBL re: Kalamazoo River dams. July 21, 1998.

Hayes, J., MDEQ. 1998b. Personal Communication with D.E. Penniman, BBL re: Kalamazoo River dams. July 29, 1998.

U.S. Army Corps of Engineers (USACE). 1979. *National Dam Safety Program Inspection Report, Kalamazoo River Basin, Plainwell No. 2 Dam*. August 1979.

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Tables

Kalamazoo River Study Group
Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Supplemental Remedial Investigations/Feasibility Studies
Proposed Plainwell No. 2 Dam Area Soil Sampling Locations

Table 1 - Proposed Soil Sample Locations Plainwell No. 2 Dam Formerly Inundated Area

Location ID	Easting (feet)	Northing (feet)
PN2-1	12781015.8	341577.5
PN2-2	12781061.5	341679.2
PN2-3	12781391.3	341433.5
PN2-4	12781297.5	341633.3
PN2-5	12781549.5	340458.8
PN2-6	12781608.9	340597.1
PN2-7	12781676.7	341195.6
PN2-8	12781621.2	341294.0
PN2-9	12781543.4	341633.8
PN2-10	12782123.4	340547.6
PN2-11	12781989.4	340927.3
PN2-12	12782146.2	340995.7
PN2-13	12782136.4	341368.6
PN2-14	12782365.0	339848.2
PN2-15	12782495.7	340046.4
PN2-16	12782348.8	340525.9
PN2-17	12782238.0	340593.6
PN2-18	12782827.5	339930.7
PN2-19	12782762.3	340356.1
PN2-20	12782533.0	340614.4
PN2-21	12782805.2	340990.9
PN2-22	12783096.7	339923.6
PN2-23	12783089.9	340480.5
PN2-24	12782906.5	340798.2
PN2-25	12783388.4	340225.0
PN2-26	12783289.2	340495.1
PN2-27	12783452.9	340776.2
PN2-28	12783689.4	339999.6
PN2-29	12783611.2	340547.8
PN2-30	12783869.9	340579.7
PN2-31	12783969.7	339643.2
PN2-32	12784233.8	340151.0
PN2-33	12784103.5	340431.6
PN2-34	12784211.8	340584.5
PN2-35	12784616.4	339684.9
PN2-36	12784331.6	339932.7
PN2-37	12784402.0	340299.2
PN2-38	12784875.3	340025.7
PN2-39	12784637.0	340334.8
PN2-40	12781649.5	340113.1
PN2-41	12782111.0	340215.4
PN2-42	12784635.9	339523.5
PN2-43	12784985.9	339942.7
PN2-44	12784294.9	339394.3
PN2-45	12783747.6	339774.2

Notes:

Coordinates are based on the North American Datum of 1983, Michigan South Zone. Units are International Feet.

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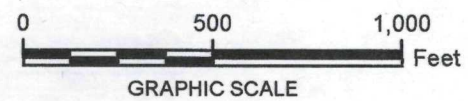
Figures

SYR-85 MTK
KRSB (64524.0500)
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LEGEND:

- APPROXIMATE AREA OF INUNDATION
BASED ON 1938 AERIAL PHOTO
- APPROXIMATE 1999 SHORELINE



NOTES:

1. SHORELINE APPROXIMATED FROM AERIAL PHOTOGRAPHY COLLECTED IN 1999.
2. APPROXIMATE AREA OF INUNDATION BASED ON 1938 AERIAL PHOTO.

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KALAMAZOO RIVER SUPERFUND SITE

APPROXIMATE AREA OF INUNDATION
1938 AERIAL PHOTO

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Infrastructure, environment, facilities

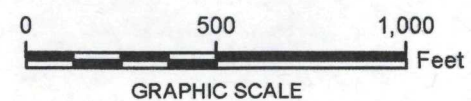
FIGURE
1

SYR-05 MTK
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LEGEND:

- APPROXIMATE AREA OF INUNDATION
BASED ON 1938 AERIAL PHOTO
- APPROXIMATE 1999 SHORELINE



NOTES:

1. SHORELINE APPROXIMATED FROM AERIAL PHOTOGRAPHY COLLECTED IN 1999.
2. APPROXIMATE AREA OF INUNDATION BASED ON 1938 AERIAL PHOTO.
3. AERIAL IMAGE DERIVED FROM ORTHOGRAPHIC DATA BY AIR LAND SURVEYS, INC. KALAMAZOO RIVER FLOWN 4/24/99.

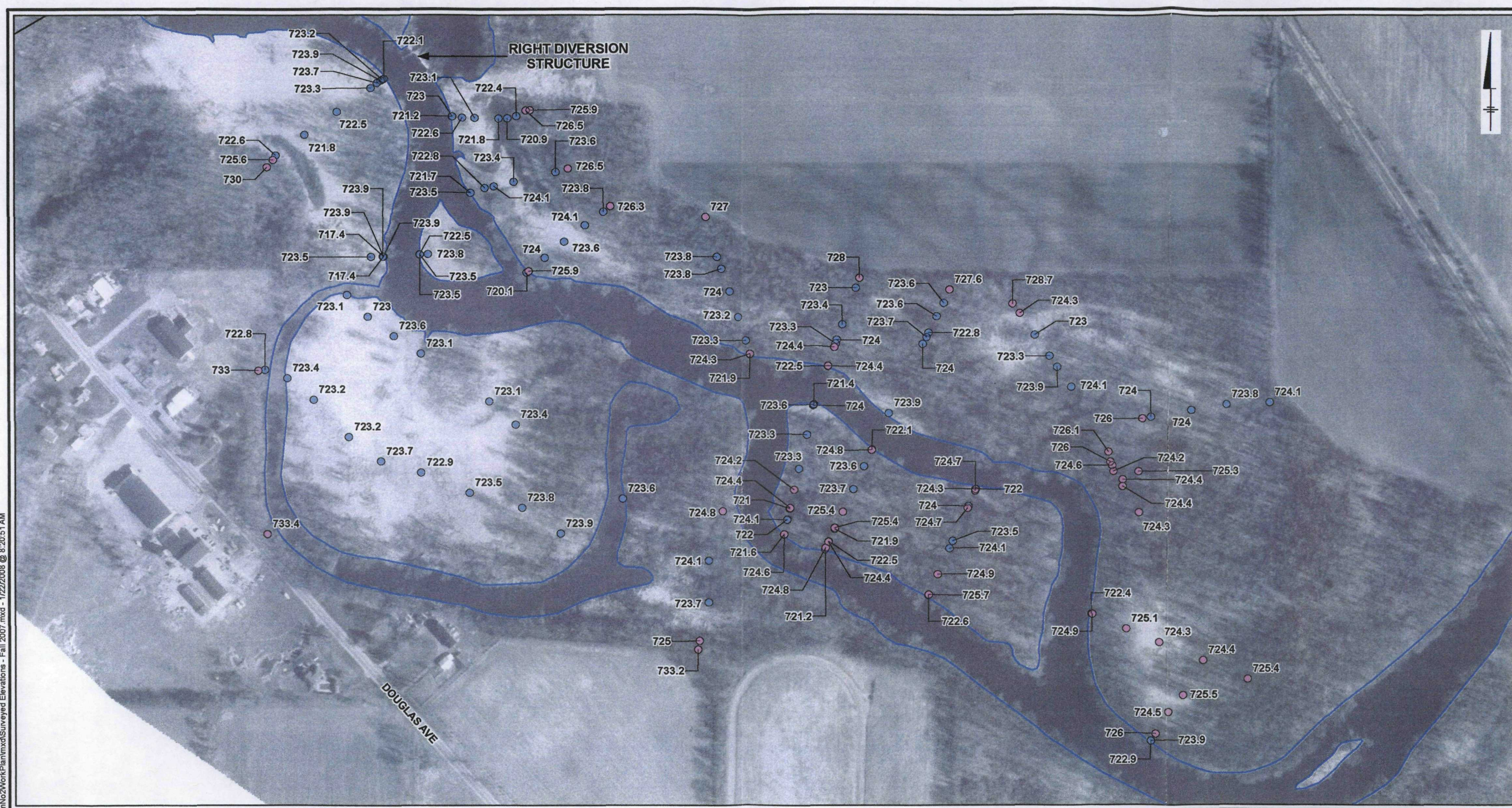
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KALAMAZOO RIVER SUPERFUND SITE

APPROXIMATE AREA OF INUNDATION
1999 vs. 1938 AERIAL PHOTOS

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FIGURE
2

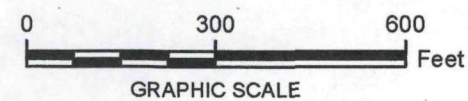
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LEGEND:

FALL 2007 SURVEY LOCATIONS:

- BELOW MAXIMUM POOL ELEVATION (< 724.2)
- ABOVE MAXIMUM POOL ELEVATION (> 724.2)
- SHORELINE



NOTES:

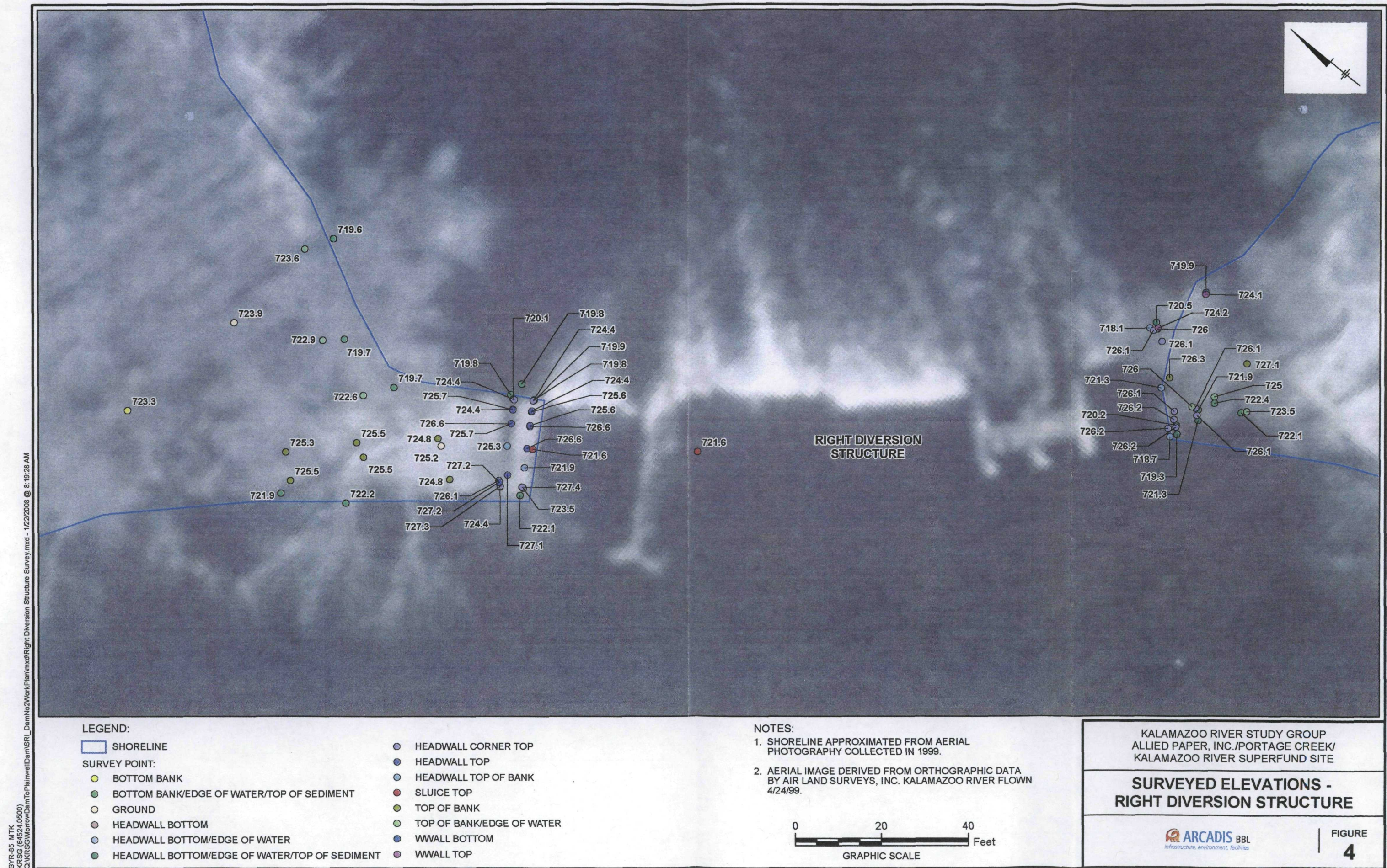
1. SHORELINE APPROXIMATED FROM AERIAL PHOTOGRAPHY COLLECTED IN 1999.
2. AERIAL IMAGE DERIVED FROM ORTHOGRAPHIC DATA BY AIR LAND SURVEYS, INC. KALAMAZOO RIVER FLOWN 4/24/99.
3. MAXIMUM POOL ELEVATIONS ESTIMATED BASED ON 1979 DAM SAFETY REPORT AND 2007 SURVEY RESULTS.

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KALAMAZOO RIVER SUPERFUND SITE

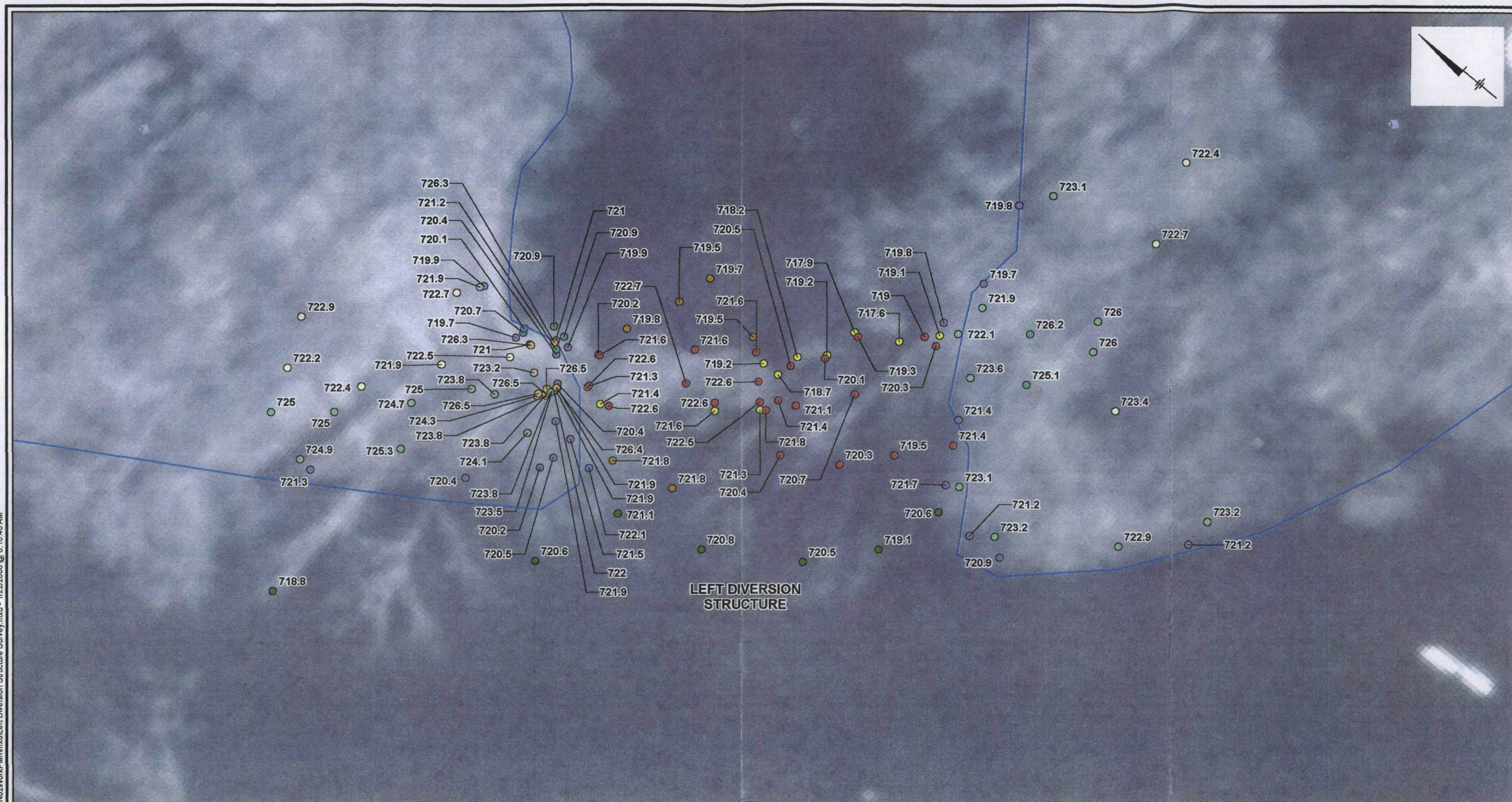
FALL 2007 SURVEY RESULTS



FIGURE
3



SVR-85 MTK
KRSR (64524.0500)
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LEGEND:

SHORELINE

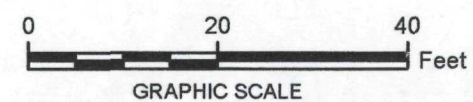
SURVEY POINT:

- BOTTOM BANK
- BOTTOM BANK/EDGE OF WATER/CREST TOP
- BOTTOM BANK/EDGE OF WATER/TOP OF SEDIMENT
- CONCRETE TOP
- GROUND
- HEADWALL REMAINS BOTTOM

- HEADWALL REMAINS TOP
- SEDIMENT
- SLUICE BOTTOM
- SLUICE TOP
- TOP OF BANK
- TOP OF BANK/EDGE OF WATER
- TOP OF SEDIMENT
- WATER ELEVATION

NOTES:

1. SHORELINE APPROXIMATED FROM AERIAL PHOTOGRAPHY COLLECTED IN 1999.
2. AERIAL IMAGE DERIVED FROM ORTHOGRAPHIC DATA BY AIR LAND SURVEYS, INC. KALAMAZOO RIVER FLOWN 4/24/99.



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**SURVEYED ELEVATIONS -
LEFT DIVERSION STRUCTURE**

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infrastructure. environment. facilities

FIGURE
5

SYR-85 MTK
KRSRG (64524.0500)
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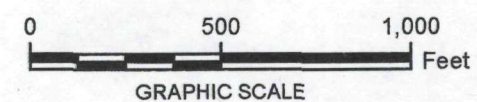


LEGEND:

- PROPOSED SAMPLE LOCATION
- FALL 2007 SURVEY LOCATIONS:
 - BELOW MAXIMUM POOL ELEVATION (< 724.2)
 - ABOVE MAXIMUM POOL ELEVATION (> 724.2)
- 1938 IMPOUNDED AREA (APPROXIMATE)
- ESTIMATED CONTOUR OF MAXIMUM POOL ELEVATION (724.2 feet)
- SHORELINE

NOTES:

1. 1938 IMPOUNDED AREA APPROXIMATED FROM HISTORIC AERIAL PHOTOGRAPHY.
2. SHORELINE APPROXIMATED FROM AERIAL PHOTOGRAPHY COLLECTED IN 1999.
3. EXTENT OF MAXIMUM POOL ELEVATION APPROXIMATED FROM FALL 2007 SURVEY DATA, FIELD RECONNAISSANCE, HISTORIC AERIAL PHOTOGRAPHY, AND 1979 DAM INSPECTION REPORT.
4. AERIAL IMAGE DERIVED FROM ORTHOGRAPHIC DATA BY AIR LAND SURVEYS, INC. KALAMAZOO RIVER FLOWN 4/24/99.
5. ALL ELEVATIONS REFERENCE THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.



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PROPOSED SOIL SAMPLE LOCATIONS
IN PLAINWELL No. 2 DAM AREA

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Infrastructure, environment, facilities

FIGURE
6

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Attachment 1

USACE's National Dam Safety
Program Inspection Report
Figures

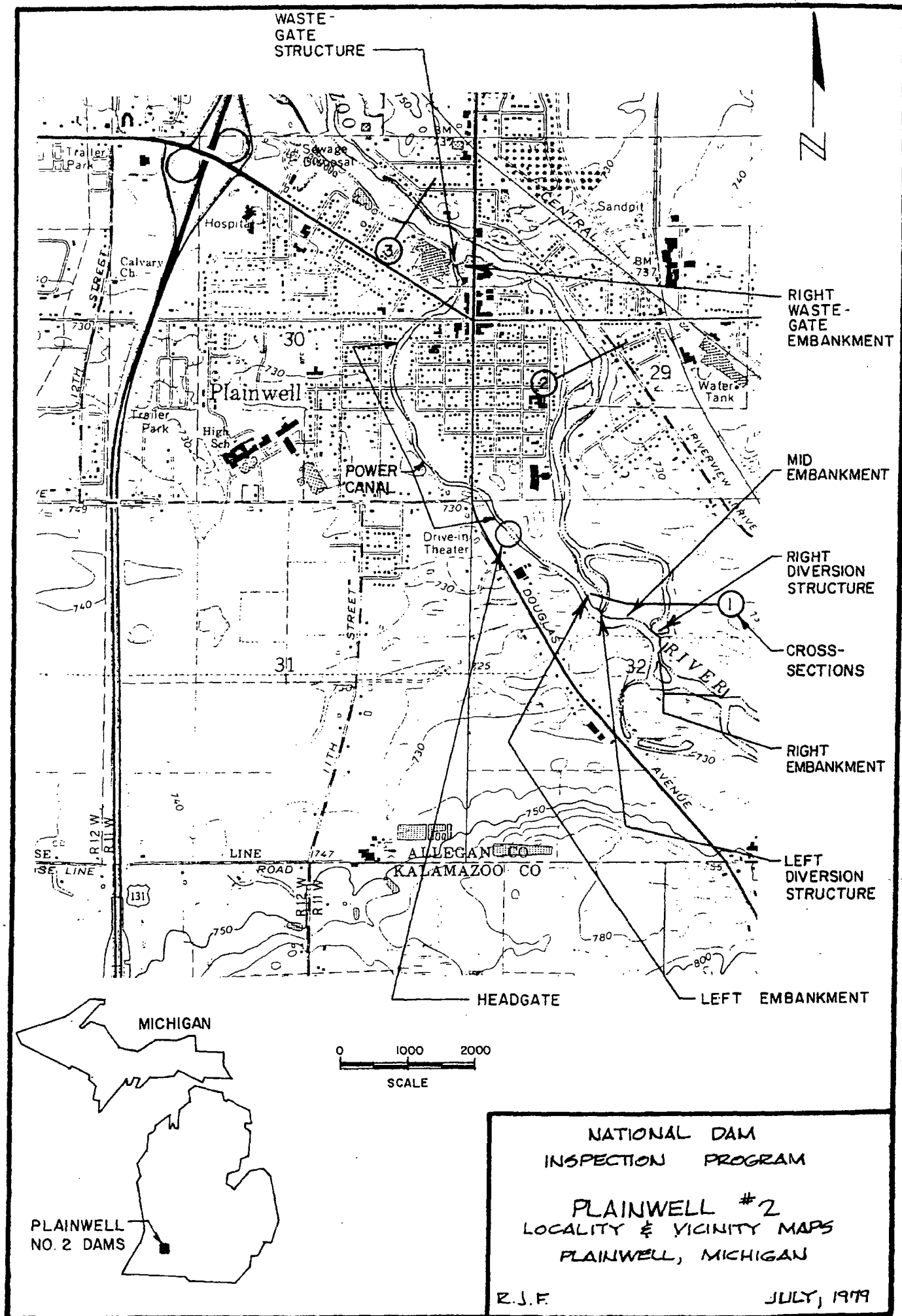


FIGURE 1

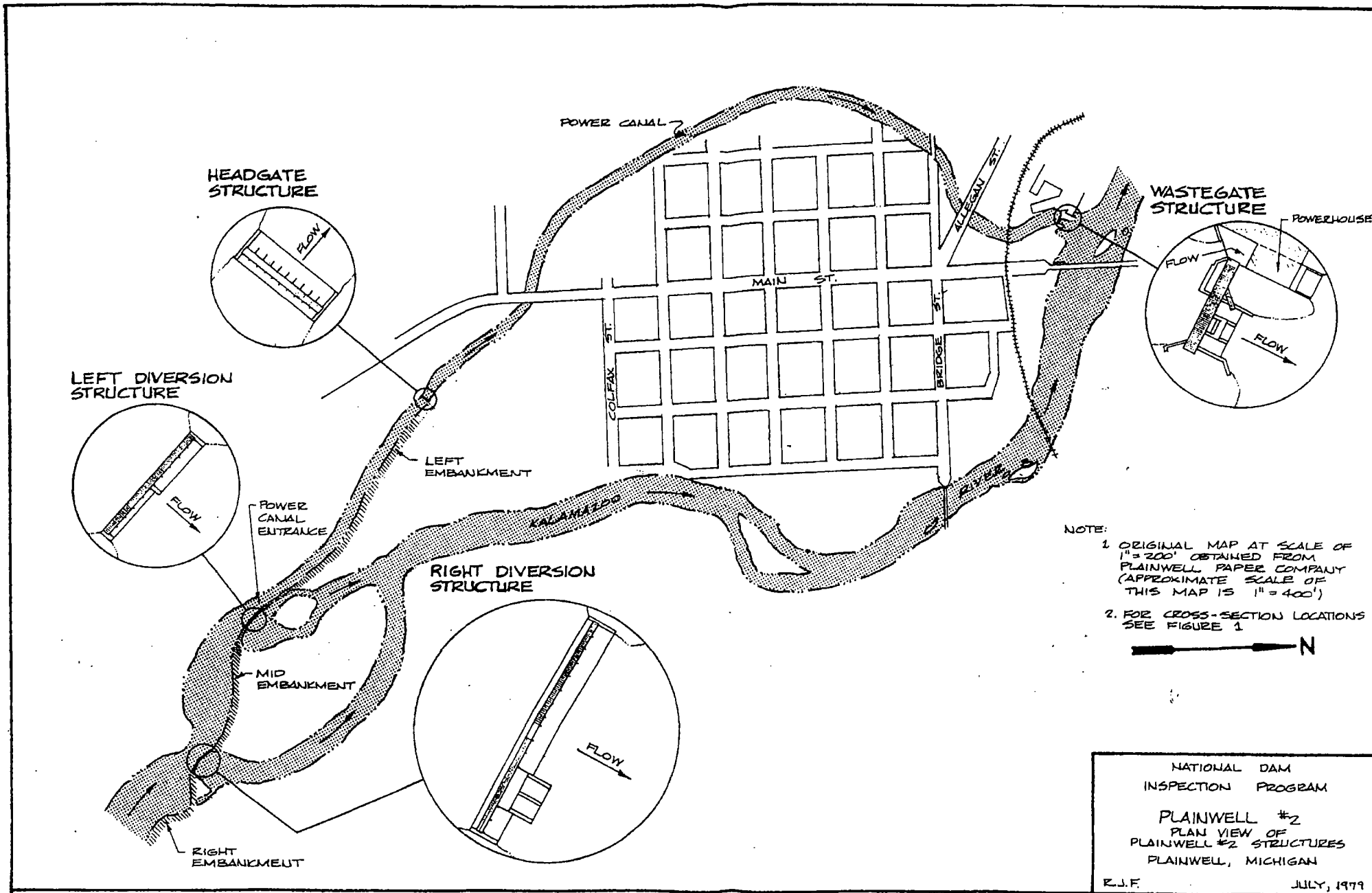


FIGURE 2